

# Two new Caecidae from the South-West Pacific Ocean and the "*Caecum insculptum* complex" (Caenogastropoda: Rissoidae)

Bret Raines\* & Mauro Pizzini# (✉)

\* PO Box 5124  
Alamogordo, New  
Mexico 88311 USA,  
rainesbk@yahoo.com

# Largo della Caffarelletta  
6, 00179 Roma, (Italy),  
pizzini.mauro@gmail.com  
(✉) Corresponding  
Author

## Abstract

Two new Caecidae species, *Caecum wami* n. sp. and *Caecum brennani* n. sp. are described from South-West Pacific Ocean. The two species are placed in an informal group herein referred to as "*Caecum insculptum* complex", based on shared characters (ribbed sculpture and crenulated terminal part of the tube). There are no other caecids in the South West Pacific sharing these characters, but many species from the Panamic and Californian area, geographically very distant from the South-West Pacific, could be referred to the "*C. insculptum* complex". These morphological characters could be due to convergence among unrelated, geographically distant species but this subject deserves further studies.

## Riassunto

Vengono descritte due nuove specie di Caecidae dell'Oceano Pacifico Occidentale.: *Caecum wami* n. sp. and *C. brennani* n. sp. Queste due specie sono simili tra di loro in alcuni caratteri morfologici (scultura a costole longitudinali e parte terminale del tubo crenulata), mentre nessuna specie finora nota per il Pacifico Occidentale mostra tali caratteri. Le due specie vengono riferite ad un gruppo informale, denominato "complesso *Caecum insculptum*" dalla specie caraibica *C. insculptum* Carpenter, 1857 che mostra questi stessi caratteri. Diverse specie delle aree panamense, californiana e caraibica potrebbero essere riferite a questo complesso. È probabile che questi caratteri simili fra specie geograficamente molto distanti siano semplicemente dovute a convergenza morfologica e, quindi, non esista una stretta relazione fra le specie che mostrano tali caratteri. Questo argomento, comunque, necessita di ulteriori studi.

## Key words

Gastropoda, Caecidae, systematics, new species, South-West Pacific, Australian region, Mariana Islands.

## Introduction

Using material sent by the Western Australian Museum (Perth, Australia) and additional specimens in possession of the first author, this study allowed a deeper knowledge of the family Caecidae in the South-West Pacific. From the examination of this copious material, two species were selected for their unique morphological characters and they herein described as new. The two new species show some similarities to other species from the distant Panamic and Californian coasts. Such unexpected similarities are discussed in the present work.

The other species found in the South-West Pacific region, mostly already known, will be treated in-depth in following works.

## Material and methods

The authors of the present work had the opportunity to study material coming from the North-West of Australia stored in the Western Australian Museum. Additional study material from the Marshall and Mariana Islands is in possession of the first author. Most of this material is still under study and will be the subject of future articles.

The types localities of the two new species are reported

in Fig. 1. SEM photographs were taken by Daniel L. Geiger (Santa Barbara Museum of Natural History (California, USA).

The following type material (all from photographs) was used for comparisons (see abbreviations and acronyms below):

*Caecum insculptum* Carpenter, 1857, 2 syntypes, Mazatlán, "off *Spodylus*" (NHML, n°-1857.6.4.15141-2); *C. subspirale* Carpenter, 1857, 3 syntypes, Mazatlán, "off *Spodylus*" (NHML, n°-1857.6.4.1515); *C. obtusum* Carpenter, 1857, 2 syntypes, Mazatlán, "off *Spodylus*" (NHML, n°-1857.6.4.1517); *C. plicatum* Carpenter, 1858, 1 syntype, Mauritius Is. (NHML, n°-1858.12.9.15); *C. plicatum* Carpenter, 1858, 5 syntypes, West Indies (NHML, n°-1858.12.9.15); *C. abnormale* Carpenter, 1857, 1 syntype, Mazatlán, "off *Spodylus*" (NHML, n°- 1857.6.4.1516). *C. mirabile* (Folin, 1867a), 1 syntype, Iles aux Perles, Gulf of Panama (MNHN); *C. mirificum* (Folin, 1867a), 1 syntype, San Miguel, Gulf of Panama (MNHN).

The following abbreviations and acronyms are used:

AMS = Australian Museum, Sydney (Australia); LACM = Natural History Museum of Los Angeles County (CA, USA); MNHN = Muséum National d'Histoire Naturelle, Paris (France); MZB = Museo di Zoologia di Bologna (Italy); NHML = Natural History Museum, London (U.K.); NMNS = National Museum of Nature and Science (Tsukuba City, Japan); SBMNH = Santa Barbara Museum of Natural History (CA, USA); WAM = West-

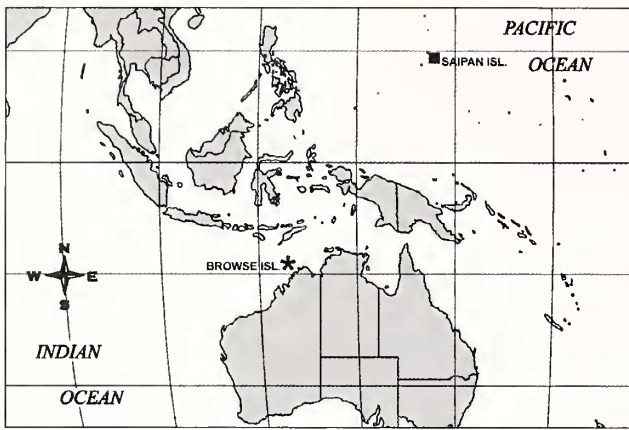


Fig. 1. Type localities of *Caecum wami* n. sp. (star) and *Caecum brennani* n. sp. (square).

Fig. 1. Località tipo di *Caecum wami* n. sp. (asterisco) e di *Caecum brennani* n. sp. (quadrato).

ern Australian Museum, Perth (Australia); BR = Bret Raines colln; MP = Mauro Pizzini colln; leg. = collected by; diam. = diameter; es (s) = empty shell (s); lc (s) = live collected specimen (s).

Class Gastropoda Cuvier, 1797  
 Superfamily Rissooidea Gray J.E., 1847  
 Family Caecidae Gray J. E., 1850  
 Genus *Caecum* s.s. Fleming, 1813

*Caecum wami* n. sp.  
 (Figs 2A-D, 4A, 5A, 6A, B)

### Type material

Holotype WAM S34645 (es) and 5 paratypes (2 juv.) WAM S34642, 2 paratypes MNHN 22062, 2 paratypes NHML Reg. No. 20090294 (all es) from the type locality, 2 paratypes WAM S34644 (both es), Port Hedland, Western Australia, 10/1974, leg. J. Hewitt.

### Type locality

Browse Is., North-Western Australia, 124°E, 14° S, 1970.

### Description

Tube cylindrical, slightly arched, crossed by 28-30 longitudinal riblets weakly raised and twisted (Fig. 2A, B). Interspaces not very deep, about three times wider than riblets. Micro-sculpture consisting of very fine growth striation covering the entire tube, including the top of riblets (Fig. 6B). Occasionally a very weak longitudinal striation may be present within interspaces, only seen under high magnification. Mucro double-humped, very protruded over the cutting plane (Fig. 4A). In ventral view, with the apical end at the top, the mucro is oriented towards the right side at about 90°; its ventral margin is irregularly spherical, while the dorsal margin has a squashed-top ball shaped. Aperture circular (Fig. 6A), weakly contracted and rimmed by three rings, crossed and made finely crenulate by the longitudinal

sculpture (Fig. 5A). Colour whitish in beached specimens. Operculum and soft parts unknown.

Holotype measurements: length 2.1 mm, diam. 0.5 mm.

### Distribution

The species is only known from Browse Island (North-Western Australia) and Port Hedland (Western Australia).

### Etymology

The new species is dedicated to WAM (Western Australian Museum, Perth).

### Remarks

The new species has a unique septum shape, making this species clearly distinct from other similar species. The septum of *C. reversum* Carpenter, 1857 (Pizzini et al., 2007: fig. 2A, B) is similar to that of *C. wami* in orientation (about 90° towards the right side), but it lacks the double-humped shape. Furthermore, the shell sculpture only consists of growth striae.

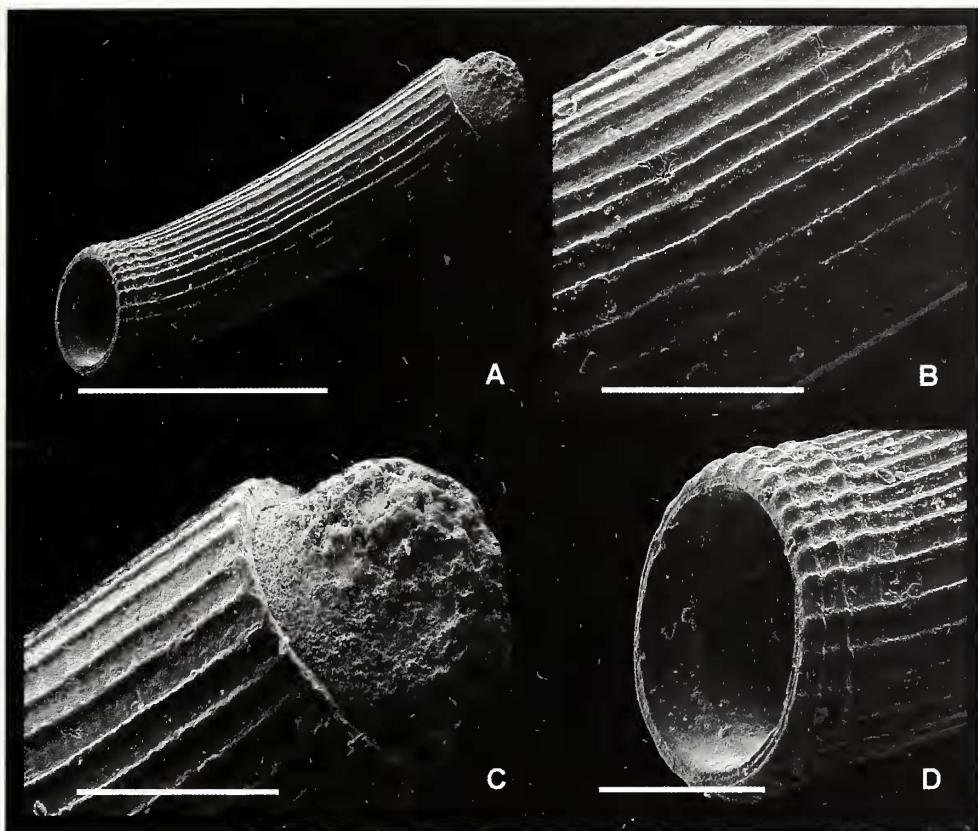
In sculpture, *C. wami* n.sp. shows some resemblance with other species from the Californian and Panamic coasts: *C. insculptum*, *C. subspirale* [= *C. obtusum*], *C. mirabile* and *C. mirificum*. However, the septum shape of *C. wami* n.sp. is markedly different.

The new species has 28-30 longitudinal ribs (Fig. 6A), which are somewhat twisted in the adapical portion of the tube, and slightly raised, while *C. insculptum* (Fig. 7A-C) shows 16-18 ribs, strongly raised, not twisted, with deep interspaces. Compared to *C. subspirale* (26-29 ribs) (Fig. 8A-C), in the new species the ribs are less raised, sharper and more regular, with no rough rings, except near the aperture. We agree with Lightfoot (1993) about the synonymy between *C. obtusum* and *C. subspirale*.

All the abovementioned species lack a fine longitudinal striation. On the contrary, both *C. mirabile* (Folin, 1867: p. 45) and *C. mirificum* (p. 47) display a weak longitudinal striation, only seen under high optical magnification. The French author placed the former in the section "Coteles" (ribbed) and the latter in the section "Quadrillé" (chequered). The second group includes species with a reticulated sculpture all over the tube, stronger in the abapical portion, resulting from the crossing of ribs and growth lines. However, we suspect that *C. mirabile* and *C. mirificum* are synonyms, since *mirificum* has a sculpture quite similar to that of *mirabile*, and could be placed in the ribbed group. Unfortunately, the MNHN's syntypes are in poor conditions and did not allow us to solve this problem.

Regarding the similarities with *C. brennani* n. sp., see the remarks of the latter species.

Other species from the Atlantic (Caribbean) having similar characters (i. e. longitudinal ribs and crenulation on the ring near the aperture) to those of *C. wami* are *C.*



**Fig. 2.** *Caecum wami* n. sp., holotype. **A.** Shell (scale bar = 1 mm); **B.** Tube (scale bar = 250  $\mu$ m); **C.** Septum (scale bar = 250  $\mu$ m); **D.** Aperture (scale bar = 250  $\mu$ m).

**Fig. 2.** *Caecum wami* n. sp., olotipo. **A.** Conchiglia (scala = 1 mm); **B.** Tubo (scala = 250  $\mu$ m); **C.** Setto (scala = 250  $\mu$ m); **D.** Apertura (scala = 250  $\mu$ m).

*plicatum* (Figs 4H, 5H), *C. cycloferum* Folin, 1867c, and *C. multicosatum* Folin, 1867b. The holotypes of the last two species were figured in Absalão & Pizzini (2002).

*Caecum brennani* n. sp.  
(Figs 3A-D, 4B, 5B, 6C-D)

#### Type material

Holotype (LACM 3103), 3 paratypes (LACM 3104, 3105, 3106), 1 paratype (AMS), 1 paratype WAM S34642, and 1 paratype plus an early stage MNHN 22164 (all es) from the type locality; 1 paratype and few fragments (BR) (es) from the Kwajalein Atoll.

#### Type locality

Marpi, Saipan (Mariana Islands), 15°17'30"N, 145°48'15"E.

#### Description

Tube cylindrical, slightly arched, crossed by 15-18 pronounced undulating ribs, not twisted (Fig. 3A), with interspaces about twice wide than ribs (Fig. 3B). At about 3/4 of the tube length, in its abapical portion, 8-9 rings appear, crossing the ribs and producing a reticulated sculpture, with the rings increasing in strength towards the aperture. Very weak to obsolete longitudinal striation may be present, only seen under high magnification. The septum is mucronate, with the mucro oriented to the right side of about 45°, strongly raised over the cutting plane, terminating with a sheared appearance (Figs 3C, 4B). Aperture perfectly circular, abruptly

constricted. Operculum and soft parts unknown. Holotype size: length 2.6 mm, diameter 0.6 mm.

#### Distribution

The species is known from Saipan (Mariana Islands) and the Kwajalein Atoll (Marshall Islands).

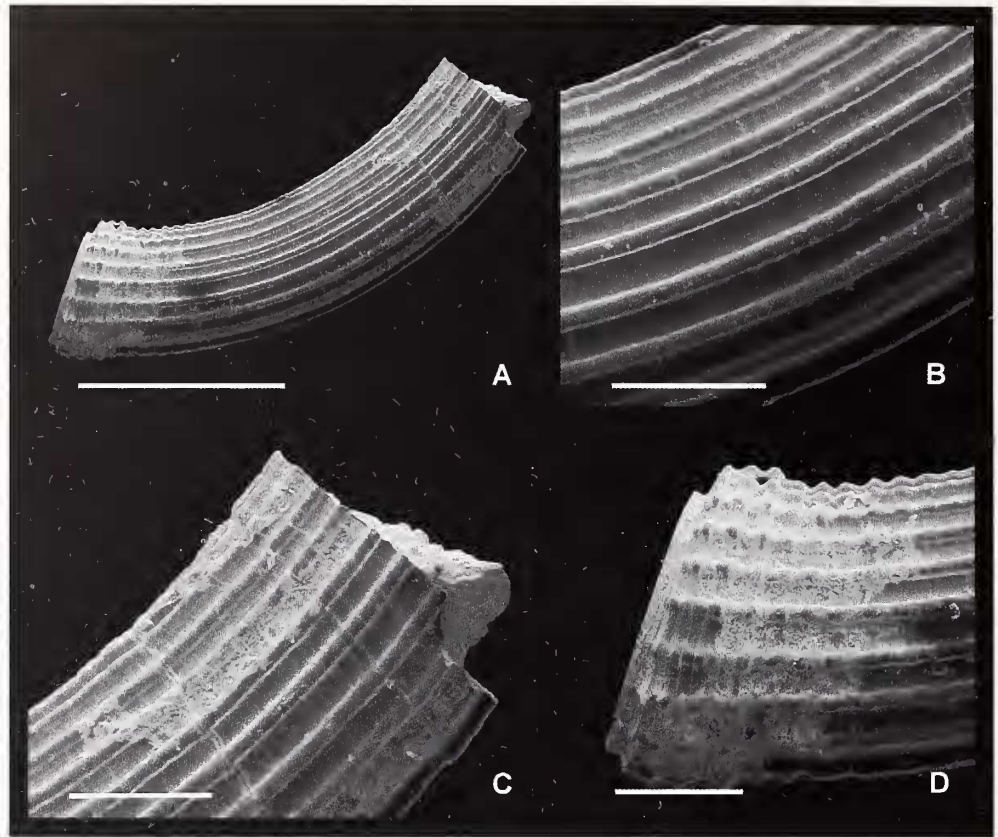
#### Etymology

The new species is dedicated to Doug Brennan, who has supported our research by providing many sediment samples.

#### Remarks

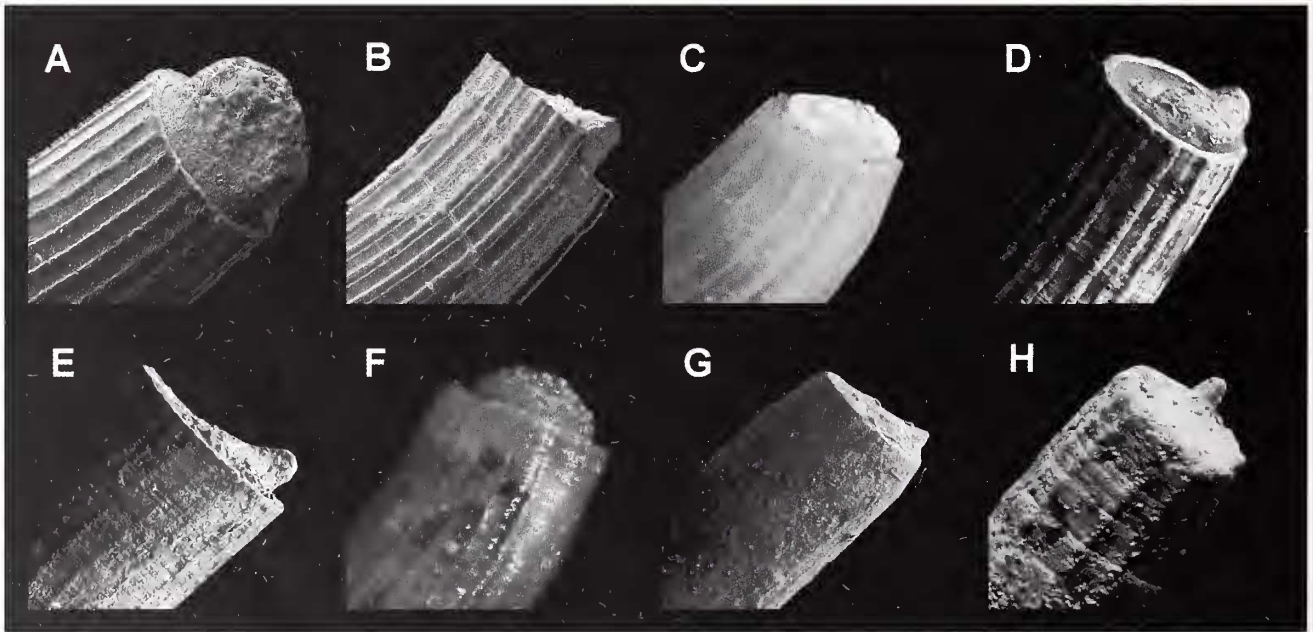
*Caecum brennani* n. sp. is quite similar to *C. wami* n. sp. in sculpture (longitudinal riblets) and microsculpture (microscopic longitudinal striation among the riblets). The main differences between the two species are the different shape of the septum (mucronate in *brennani*, double-humped in *wami*), and in the different number of riblets (15-18 well defined, undulating, not twisted in *brennani*, vs 28-30, twisted in *wami*).

The other species similar to *C. brennani* are the same as those considered for *C. wami*, i.e. *C. insculptum*, *C. subspirale*, *C. mirabile* and *C. mirificum*. Of these, the species most similar to *brennani* is *insculptum*. The new species has 8-9 rings in its abapical portion, crossing the longitudinal ribs, while *C. insculptum* has no rings (Carpenter, 1857: p. 315) (Fig. 7B, C). Moreover, in *C. insculptum* the rib section is squarish and the interspaces are deeper than in *C. brennani*.



**Fig. 3.** *Caecum brennani* n. sp., holotype. **A.** Shell (scale bar = 1 mm); **B.** Tube (scale bar = 250 µm); **C.** Septum (scale bar = 250 µm); **D.** Aperture (scale bar = 250 µm).

**Fig. 3.** *Caecum brennani* n. sp., olotipo. **A.** Conchiglia (scala = 1 mm), **B.** Tubo (scala = 250 µm), **C.** Setto (scala = 250 µm), **D.** Apertura (scala = 250 µm).



**Fig. 4.** Septa. **A.** *C. wami* n. sp.; **B.** *C. brennani* n. sp.; **C.** *C. mirabile* (Folin, 1867); **D.** *C. insculptum* Carpenter, 1857; **E.** *C. abnormale* Carpenter, 1857; **F.** *C. mirificum* (Folin, 1867); **G.** *C. subspirale* Carpenter, 1857; **H.** *C. plicatum* Carpenter, 1857.

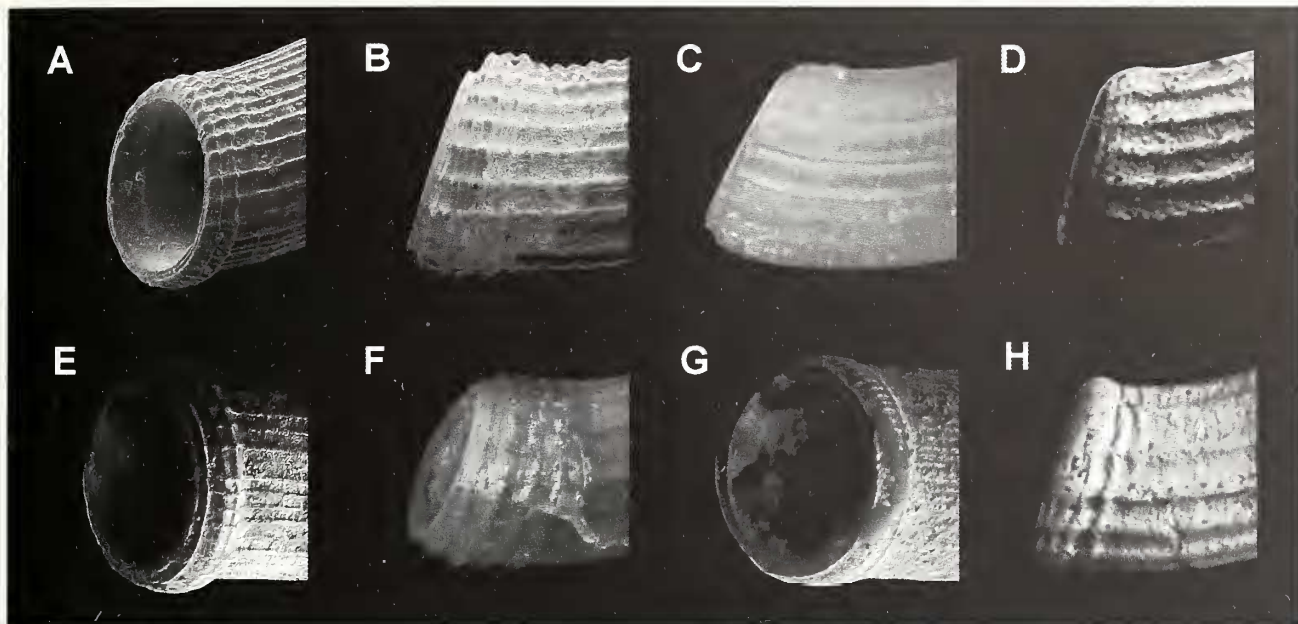
**Fig. 4.** Setti. **A.** *C. wami* n. sp.; **B.** *C. brennani* n. sp.; **C.** *C. mirabile* (Folin, 1867); **D.** *C. insculptum* Carpenter, 1857; **E.** *C. abnormale* Carpenter, 1857; **F.** *C. mirificum* (Folin, 1867); **G.** *C. subspirale* Carpenter, 1857; **H.** *C. plicatum* Carpenter, 1857.

Another species markedly similar to *C. brennani* is *C. abnormale* (Figs 4E, 5E), described from Mazatlán, Gulf of California (Mexico). It has the same general shape and the same mucro tipology as the new species, but it differs by having about 18 weak, not undulating ribs. In addition, *C. brennani* is longer, has growth striation only seen under high magnification and several rings crossing the ribs towards the abapical portion of the tube,

giving a reticulated appearance. In *C. abnormale*, there only 2-3 fine rings near the aperture.

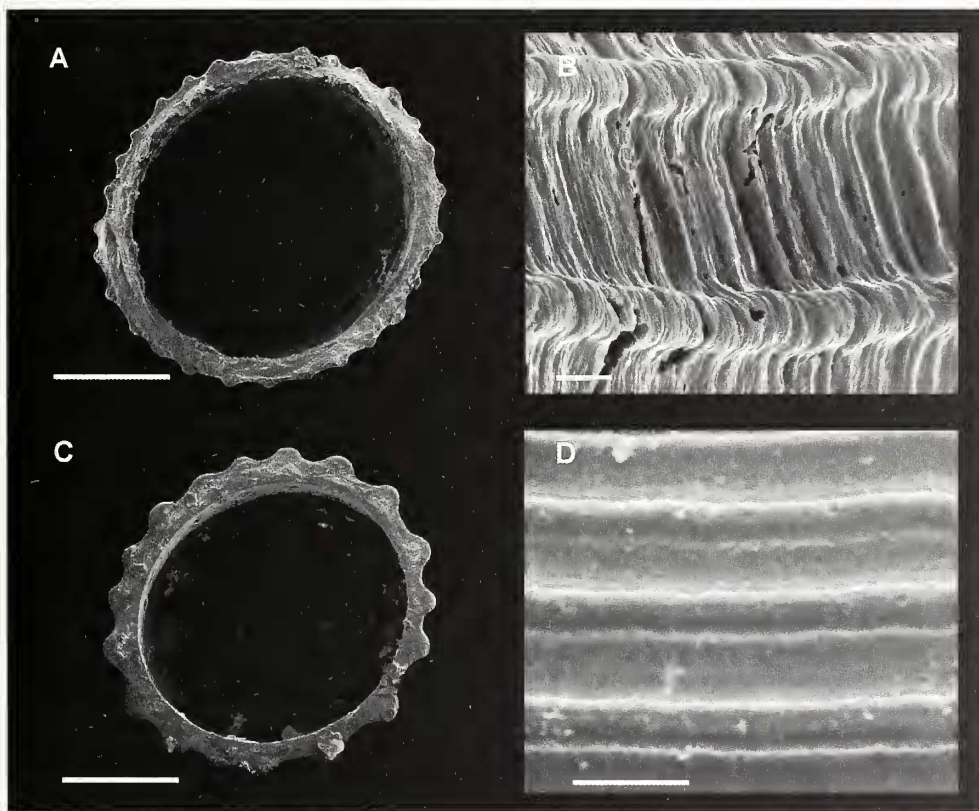
## Conclusions

On the basis of their morphological characters, we decided to place *Caecum wami* n. sp. and *C. brennani* n. sp.



**Fig. 5.** Apertures **A.** *C. wami* n. sp.; **B.** *C. brennani* n. sp.; **C.** *C. mirabile* (Folin, 1867); **D.** *C. insculptum* Carpenter, 1857; **E.** *C. abnormale* Carpenter, 1857; **F.** *C. mirificum* (Folin, 1867); **G.** *C. subspirale* Carpenter, 1857; **H.** *C. plicatum* Carpenter, 1857.

**Fig. 5.** Aperture **A.** *C. wami* n. sp.; **B.** *C. brennani* n. sp.; **C.** *C. mirabile* (Folin, 1867); **D.** *C. insculptum* Carpenter, 1857; **E.** *C. abnormale* Carpenter, 1857; **F.** *C. mirificum* (Folin, 1867); **G.** *C. subspirale* Carpenter, 1857; **H.** *C. plicatum* Carpenter, 1857.



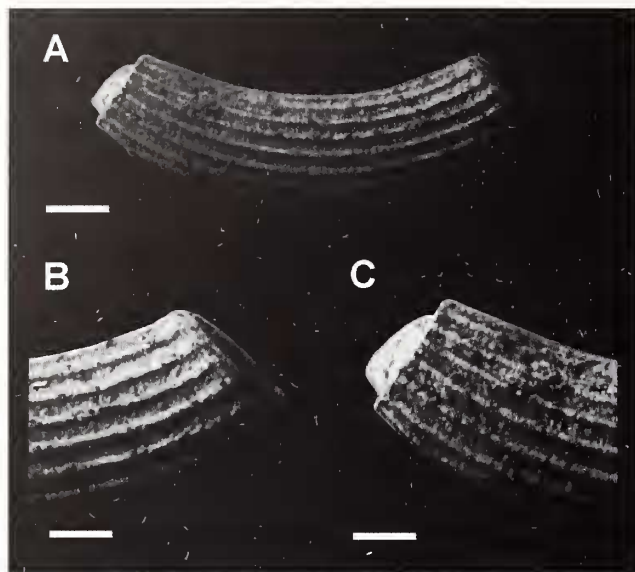
**Fig. 6.** **A, B.** *Caecium wami* n. sp. **A.** Cross section of the tube (scale bar = 200 µm); **B.** Microsculpture (scale bar = 10 µm). **C, D.** *Caecium brennani* n. sp. **C.** Cross section of the tube (scale bar = 200 µm); **D.** Microsculpture (scale bar = 125 µm)

**Fig. 6.** **A, B.** *Caecium wami* n. sp. **A.** Sezione del tubo (scala = 200 µm); **B.** Microscultura (scala = 10 µm). **C, D.** *Caecium brennani* n. sp. **C.** Sezione del tubo (scala = 200 µm); **D.** Microscultura (scala bar = 125 µm)

in an informal group, here referred to as "*C. insculptum* complex", after *C. insculptum* Carpenter, 1857 which has the same characters. This is in analogy with the "*Elephantulum* section" of Carpenter (1857), containing species sharing similar tube sculpture and septum shape. *Elephantulum* has been used both as a subgenus and even a genus. The "*C. insculptum* complex" shows binding elements, such as the unique sculpture, consisting of longitudinal ribs and crenulated terminal portion

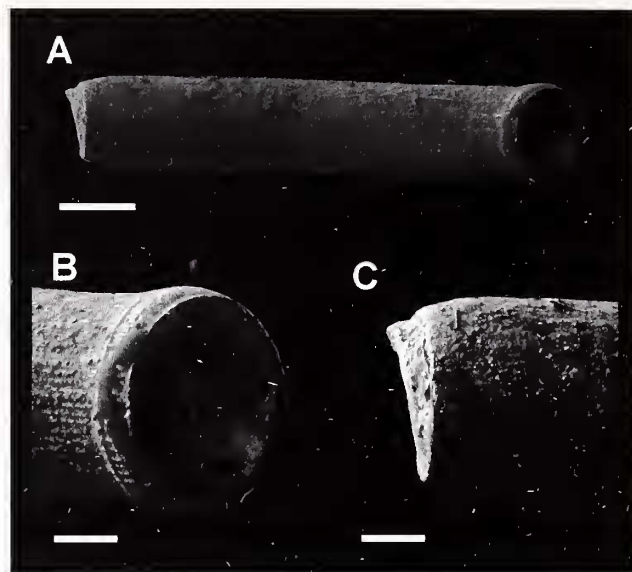
of the tube, as seen in *C. wami* n. sp. and *C. brennani* n. sp. Together with *C. insculptum*, *C. subspirale*, *C. obtusum*, *C. plicatum*, *C. abnormale*, *C. mirabile* and *C. mirificum*, other Western Atlantic Caecidae can be placed in this species complex, as well as *C. cycloferum* Folin, 1867c and *C. multicosatum* Folin, 1867b.

It is not our intention to consider the "*C. insculptum* complex" as a taxonomic category. Our goal is simply to underline that there is some kind of morphological



**Fig. 7.** *Caecum insculptum* Carpenter, 1857 (syntype n°-1857.6.4.1514). **A.** Shell (scale bar = 455 µm); **B.** Aperture detail (scale bar = 286 µm); **C.** Septum detail (scale bar = 286 µm).

**Fig. 7.** *Caecum insculptum* Carpenter, 1857 (sintipo n°-1857.6.4.1514). **A.** Conchiglia (scala = 455 µm); **B.** Dettaglio dell'apertura (scala = 286 µm); **C.** Dettaglio del setto (scala = 286 µm).



**Fig. 8.** *C. subspirale* Carpenter, 1857 (syntype, n°-1857.6.4.1515). **A.** Shell (scale bar = 566 µm); **B.** Aperture detail (scale bar = 200 µm); **C.** Septum detail (scale bar = 200 µm).

**Fig. 8.** *C. subspirale* Carpenter, 1857 (syntipo, n°-1857.6.4.1515): **A.** Conchiglia (scala = 566 µm); **B.** Dettaglio dell'apertura (scala = 200 µm); **C.** Dettaglio del setto (scala = 200 µm).

closeness among geographically distant Caecidae species, while considering that there are also some isolation situations (e.g. Easter Island) which encourages biodiversity and differentiation (Raines & Pizzini, 2005). It is possible to hypothesize that these sculptural characters are simply convergent, and that species sharing these characters are unrelated to each other. The argument, far from being exhaustive, deserves further investigation in different geographic areas (currently under development) and with the help of the palaeontological record.

### Acknowledgements

We wish to thank, all the WAM's staff, in particular Ian Loch, for sending us the material stored in the museum, the MNHN's staff for providing digital photos of Folin's original types, and the NHML's staff for the SEM photos of Carpenter's original types. We are also grateful to Daniel L. Geiger (SBMNH) and to A. Bonfitto (MZB) for the SEM photos of this work. Many thanks also to Doug Brennan and Wesley Blacketer for providing marine sediment samples from Saipan and the Kwajalein Atoll and to an anonymous reviewer for useful comments and suggestions.

### References

- ABSALÃO R. S. & PIZZINI M., 2002. Critical analysis of subgeneric taxa of the Subfamily Caecinae (Caecidae: Caenogastropoda). *Archiv für Molluskenkunde*, **131** (1-2): 167-182.
- BRANN, D.C., 1966. *Illustrations to "Catalogue of the collection of Mazatlan Shells" by Philip P. Carpenter*. Paleontological Research Institute, Ithaca, New York. Plates 32-37.
- CARPENTER, P.P., 1857. *Catalogue of the collection of Mazatlan*

*shells in the British Museum. Reprint*. Paleontological Research Institution. Ithaca, New York. pp. 312-330.

- CARPENTER, P.P., 1859 [1858]. First steps towards a monograph of the Caecidae, a family of rostriferous Gastropoda. *Proceedings of the Zoological Society, London*, **26**: 413-444.
- FOLIN, L., 1867a. Les méléagrincolles: espèces nouvelles. *Recueil des publications de la Société havraise d'études diverses*, Havre, Imprimerie Lepelletie, vol. 33: 74 pp.
- FOLIN, L., 1867b. Rade de La Guayra, in de Folin L. & Perrier (ed.), *Les Fonds de la mer*, **1**: 28-32, pl. 3, figs 4,5.
- FOLIN, L., 1867c. Rade de La Guayra, in de Folin L. & Perrier (ed.), *Les Fonds de la mer*, **1**: 28-32, pl. 4, figs. 1,2.
- LIGHTFOOT, J., 1993. Caecidae of the Panamic Province. Part Two. *Of Sea & Shore*, **16** (2): 75-87.
- PIZZINI M., RAINES B. & NOFRONI I. 2007. A new Caecid from Panama (Pacific) with illustration of *Caecum reversum* (Carpenter, 1857) - (Caenogastropoda: Risssooidea Gray J.E., 1847). *Iberus*, **25** (2): 1-7.
- RAINES, B. & PIZZINI, M. 2005. Contribution to the knowledge of the Family Caecidae: 16. Revision of the Caecidae of Easter Island (Chile) - (Caenogastropoda: Risssooidea Gray J.E., 1847). *Iberus*, **23** (1): 49-65.